

SIEMENS

UROSKOP ACCESS

SP

Quality Assurance

IQAP

**for FLUOROSPOT Compact
Imaging System**

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Customer Specific Adjustments

1 - 1

This table can be filled by CSE if customer specific adjustments are done. There is no need to fill it out by factory!

Safety Information

General Safety Information



WARNING

Danger of damage to property, injury, death!

Non-observance can lead to damage to property, injury or death.

Observe the general safety information:

- in this document,
- in the document "Medical Products; Safety Information; General Safety Notes" and
- the safety information according to ARTD part 2 ("Safety and Radiation Protection Guidelines").

General Safety Information - Electrical



WARNING

Electrical safety! After opening of the covers live parts are accessible.

Non-observance can lead to damage to property, serious injury up to death.

- To prevent danger, the system has to be disconnected from the mains supply prior to opening of covers.
- If working under voltage is necessary, the general safety information according to the document "Medical Products; Safety Information; General Safety Information; General Safety Notes" must be observed.



CAUTION

Live parts!

Non-observance can lead to damage to property.

Observe the ESD directives for working on the system.

Safety Information - Radiation



⚠️ WARNING

Radiation!

Non-observance can lead to illness, irreversible damage to body cells and genetic make-up up to death.

- During work at the system, when radiation has to be released, the document "Safety and Radiation Protection Guidelines" according ARTD-002.731.02 have to be observed.

Observe that:

- existing radiation protection devices are used;
- radiation protection clothes are worn;
- the distance to the source of radiation is as large as possible;
- radiation is only released if necessary;
- the setup values are as low as possible (low kV and mA values; short switch-on time) and
- the switch-on time is as low as possible.

Safety Information - Mechanical

⚠️ CAUTION

Danger of burns on hot parts or components!

Non-observance can lead to light to medium burns, especially of the hands.

After covers are opened, parts and components (esp. cooling elements, high-performance parts) are accessible which can show temperatures >50°C.

To prevent burns due to touching parts and components the system has to be switched off and has to cool down for at least 5 minutes.

Safety Information - Infection

⚠️ WARNING

Risk of infections through pathogens! This product can be contaminated with infected blood or other expulsions.

Non-observance can lead to serious injury up to death.

- Avoid any contact to blood or other expulsions.
- Observe stringend the Safety Guidelines ARTD-002.731.37 for prevention of infectional diseases during customer service.

NOTE

This documentation describes the IQAP for UROSKOP Access with imaging system FLUOROSPOT Compact only.

What to do

During a "Basic Test" all test steps must be performed! If a test cannot be performed due to an unavailable option, mark the appropriate fields with "n. a." ("not applicable").

There is no difference between "Start-up" of the system and a "Diagnostic test" through Customer Service.



All test steps marked with this striked through "D" are **not requested** to be done during a "Diagnostic Test" or during "Start-up".



All test steps marked with the "D" are **requested** to be done during a "Diagnostic Test" or during "Start-up".

All test results must be documented in the appropriate tables.

Example:

		1
	1000 +/- 100	2
Factory:		3
f:		4
r:		

Tab. 1

1 - The nominal values for the test results shown directly on the top of each group of table fields.

2 - Factory: factory values from assembly line¹

3 - found - Enter in the row the "found" value before readjusting the specific topic. If the measured value is within the tolerances and there was no adjustment done, mark the row "readjusted" with "n. a."!

4 - readjusted - If the measured value is out of tolerance and a readjustment is necessary, enter the new adjusted value in this row!

NOTE

Factory does not enter any values in the field marked with "f:".

If there are no nominal values available, the table field (marked with "1"; Tab. 1) is empty.

-
1. Due to electronic data acquisition the values from the assembly line could be recorded in the "test certificate 1". In this case the "Factory" fields in the Image Quality Test are empty!

Required Measuring and Auxiliary Equipment

Cu test strip 17 µm	11 67 662
Precision X-ray filter, 2.1 mm Cu	99 00 598 XE999
PTW DIADOS	97 17 612 Y0388
Resolution test type 41; Factory: resolution test type 41a	28 71 820 RE999
Service PC as specified in ARTD-001.719.06	n. a.
Set of X-ray filters (10 pcs. of 0.3 mm Cu each)	44 06 120 RV090
SMfit light field luminance meter	88 81 281
TV Dynamics test case	37 90 156 X1963

Tab. 2

Abbreviations

CSE	Customer service engineer
Dept.	Department
DFR	Digital fluoroscopy
DPF	Digital pulsed fluoroscopy
DR	Exposure
ESD	Electrostatically-sensitive device
f	Frame
Fluoro	Fluoroscopy
FLC	FLUOROSPOT Compact imaging system
GV	Grey value
HCC	Hardcopy camera
HK	High contrast
IEM	Image evaluation mode
I. I.	Image intensifier
IQ	Image quality
IQAP	Image Quality Assurance Protocol

LIH	Last image hold
LP	Line pair
LUT	Look-up table
MTF	Modulation transfer function
OGP	Organ program
OSD	On-screen display
p	Pulse
pcs.	Pieces
ROI	Region of interest
SS	SS switch S1 on D100 board (generator)
SSW	Service software

Tab. 3 Abbreviations

Required Documents

Medical Products; Safety Information; General Safety Information; General Safety Notes	TD00-000.860.01
ARTD (Safety and Radiation Protection Guidelines)	ARTD, part 2 (ARTD-002.731.02)
ARTD (Prophylactic Measures Against Infectious Diseases during Service)	ARTD, part 2 (ARTD-002.731.37)
ARTD (Service-PC and Service-Software)	ARTD, part 1 (ARTD-001.719.06)

Tab. 4

Image Evaluation Mode (IEM)

Some measurements are done with the implemented "Image Evaluation Mode" (IEM). To access the IEM the following steps are necessary:

- Store the LIH image via the "Store" button for evaluating a fluoro image (Fig. 1).
This is not necessary for evaluating DR exposures.

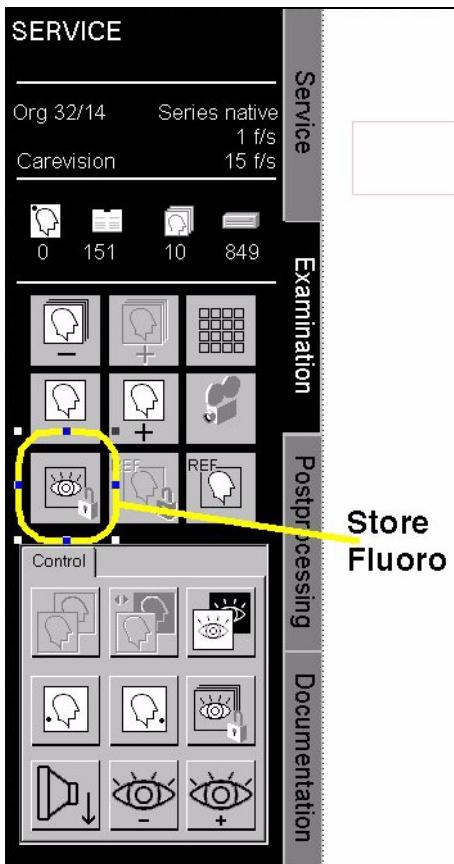


Fig. 1

- Select the "Patient" task card and the "Settings" sub task card and press the "IQ" button (Fig. 2).

The display will change to the "Postprocessing" task card (Fig. 3).

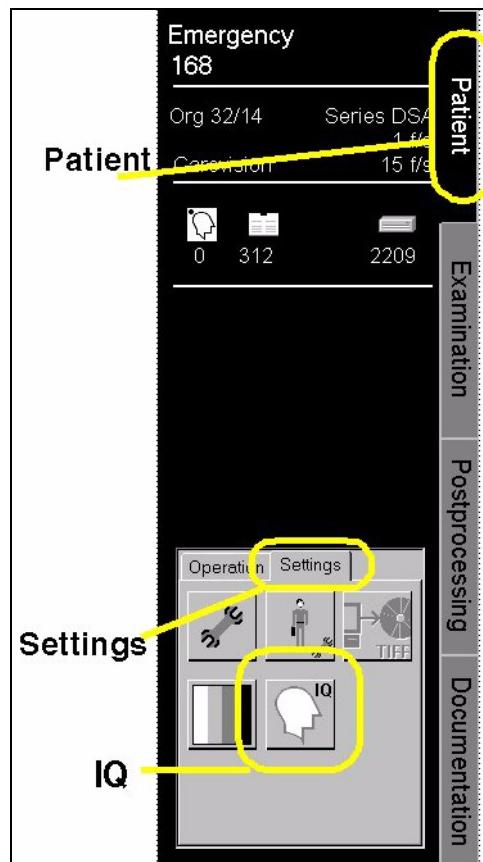


Fig. 2

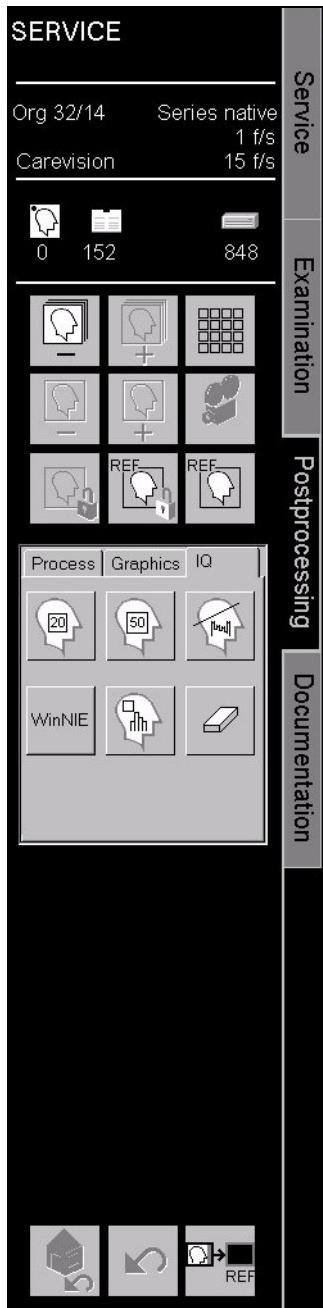


Fig. 3

The display will show the last stored image (LIH or exposure) and in the operating area buttons to evaluate the image, the service programs and the image processing mode.

Image Evaluation Functions

- ROI20

displays a ROI with 20 x 20 pixels. You can move the ROI on any position in the image.

- ROI50

displays a ROI with 50 x 50 pixels. You can move the ROI on any position in the image.

- Line profile
 - displays a horizontal line plot
- Remove
 - removes all ROI'S and/or line plots

ROI Evaluation

The x and y coordinates of a ROI are displayed in the right operating area. The grey values (GV) are displayed directly beside the ROI.

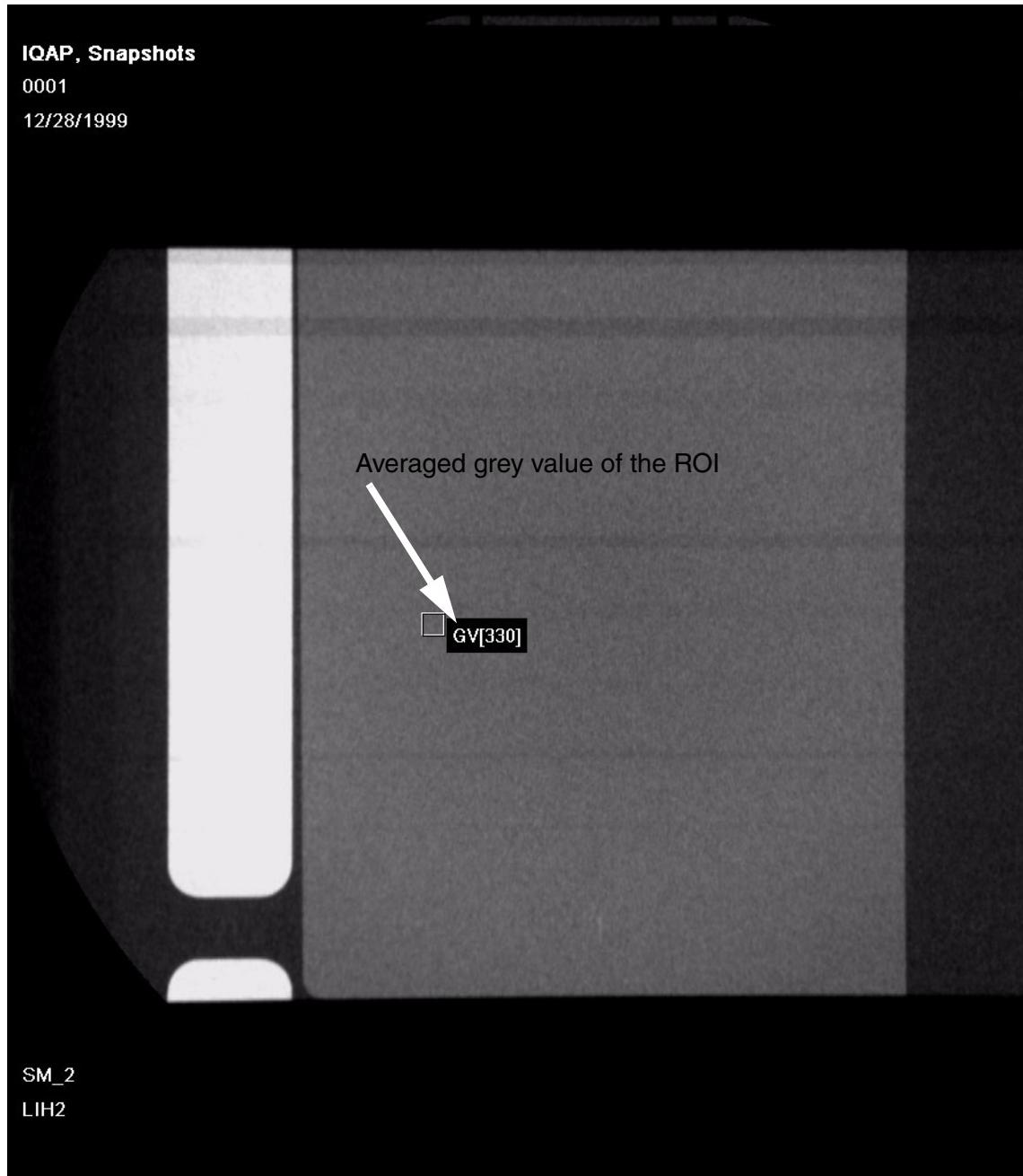


Fig. 4

Line Plot Evaluation

The line plot can be displayed as horizontal line plot only!

The y value in the operating area displays the position of the plot line. The x value describes the position of the vertical measuring line. The value (Wert) describes the grey value of the crossing point of the plot line and the measuring line.

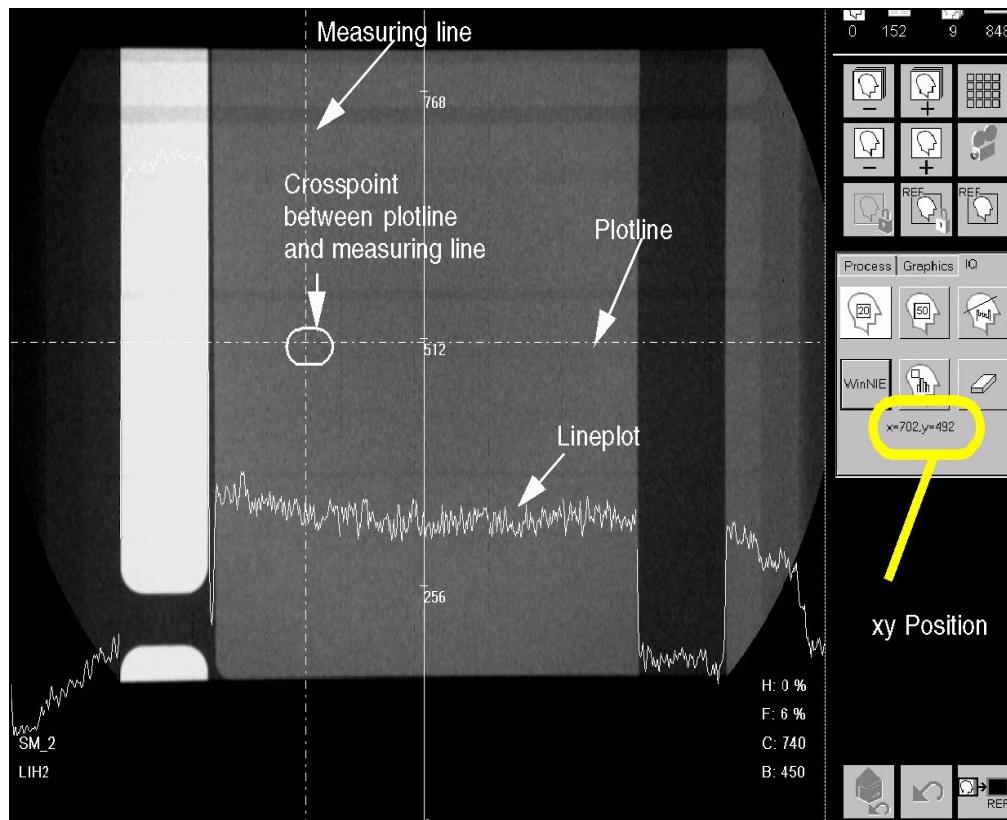


Fig. 5

Service Organ Programs

At UROSKOP Access systems are 4 different service organ programs OGP 1 - OGP 4 stored and accessable. The parameter of the service organ programs are listed in chapter "Appendix". To select one organ program, just select the OGP from the list box.

- Enter the FLC service mode.
- Select the "Examination" task card and subsequently the "Settings" sub task card
- Select the "Organ program" button.

The following window appears (Fig. 6).

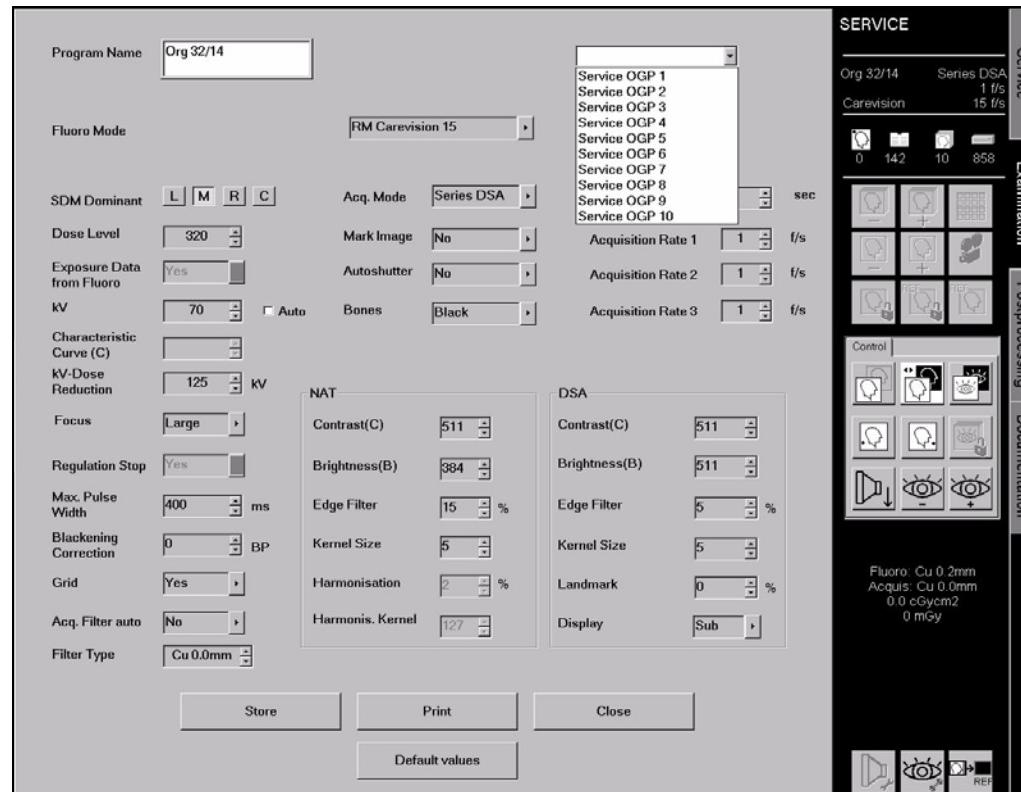


Fig. 6

Entering the FLC Service Mode

The service mode is intended for SIEMENS service only and is protected by a password.

- Select the "Settings" sub task card in the patient list.
- Select the "Service" button (Fig. 8).

The following window appears.

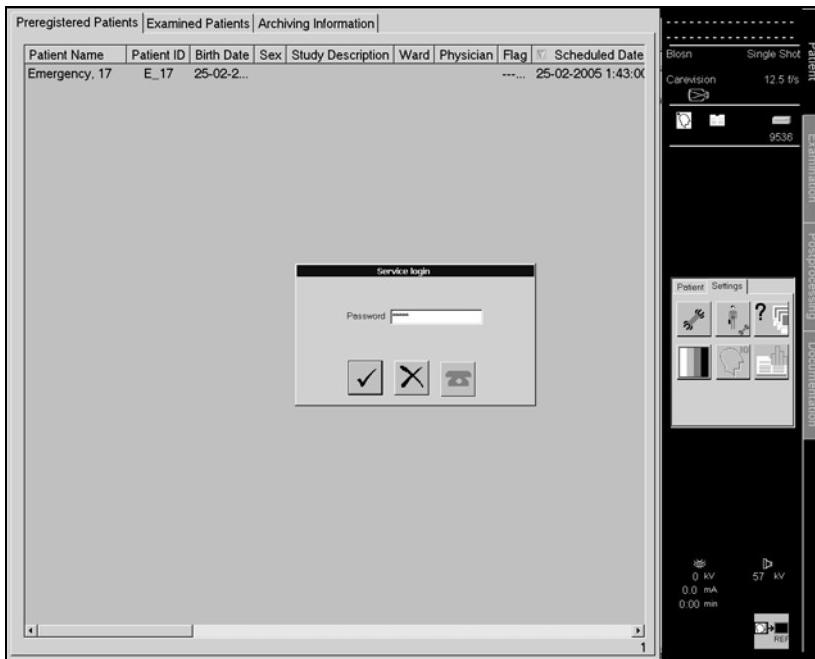


Fig. 7



Fig. 8

NOTE

The corresponding password is listed in the SP Password List, which is published in the CS Knowledge Base.

- Enter the service password and confirm by selecting the hook button (Fig. 7).
- If the entry is accepted, the service window appears with the following menu bar (Fig. 9).

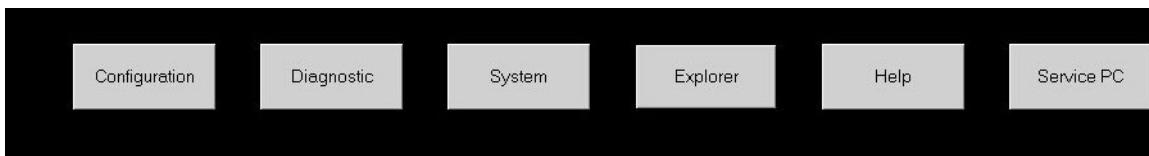


Fig. 9

Completion of Image Quality Test

Start-up/Diagnostic/Partial Tests

- Leave the original document at the unit (filed in blue binder).

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NOTE

The "Remarks" lines are provided for the CSE to document additional information which might be helpful for later "Diagnostic Tests". For this reason it is not necessary for factory to mark the "Remarks" lines as invalid through e. g. "n. a.".

If the system is equipped with a 33 cm I. I., the tables for the 40 cm I. I. are left blank and vice versa.

Customer Data

Customer	
Address	
City	
Country	
Contact	
System serial no. ¹	
Site identification no.	
AKZ no.	
Room no.	

Tab. 1

-
1. This system serial no. is the basic unit serial no. This label is located at the basic unit (Fig. 1) and contains the model no. either 5756122 or 5756130.

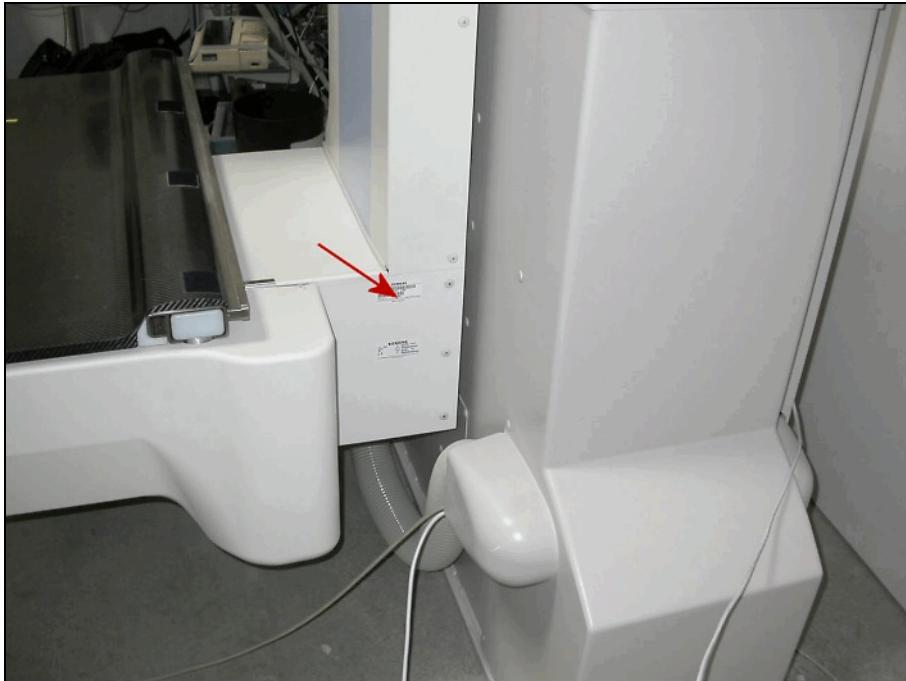


Fig. 1



Fig. 2

Remarks:.....

Image Quality Check Performed

	Tester	Review factory only	Start-up
Name			
Dept.			
Date			
Signature			

Tab. 2

Remarks:.....

Protocol Done due to

- Mark the corresponding reason in Tab. 3.

	Assembled and tested in factory
	Start-up, Date:.....
	Maintenance
	Other reasons:.....

Tab. 3

Adjustment Standards were Changed Because of

	Country-specific regulations (DHHS)
	Country-specific regulations (Japan)
	Country-specific regulations (Other reasons)
	Special customer request
	Special measurement requirements

Tab. 4

Remarks:.....

Test Equipment Factory

	Type	Next calibration date	Serial number
Dosemeter			
Measuring chamber			
2.1 mm Cu filter	n. a.	n. a.	
SMFit			
Dynamic test case		n. a.	

Tab. 5

Test Equipment Start-up/Diagnostic Test

	Type	Next calibration date	Serial number
Dosemeter			
Measuring chamber			
2.1 mm Cu filter	n. a.	n. a.	
SMFit			
Dynamic test case		n. a.	

Tab. 6

System Software Version

System software version:.....

Configuration

- The following configuration parameters should be checked before the Image Quality Test is performed:

XCS SSW

- Start the XCS SSW.
- Select "Configure/Site Structure" in the XCS SSW.
- Confirm the "Configure: Site Structure: Component Selection" window with "OK".
- Confirm the "Configure: Site Structure: Edit System" window with "OK".
 - The subsequently appearing "WARNING" window has to be confirmed with "Ja".
- Confirm the "Configure: Site Structure: Fluoro Details" window with "OK".
- Check following parameter in the "Configure: Site Structure: Edit Fluoro Programs" window:

Without the Option "Carevision"

	Mode Selection	Curve Selection	Dose rate
Auto 1	Continuous Fluoro	Paed	174
Auto 2	Continuous Fluoro	Antiisowatt	174 (USA: 226)
Auto 3	Continuous Fluoro (High Contrast)	Litho 63 kV HK ¹ (Japan: Litho 63 kV ²)	174 (USA: 400)

Tab. 7

1. with "High Contrast" (HK)
2. without "High Contrast" (HK)

NOTE

"High Contrast" is enabled through a checkbox (menu item "Mode Selection" in the "Configure: Site Structure: Edit Fluoro Programs" window).

With Option Carevision

	Mode Selection	Curve Selection	Pulse settings	Pulse frequency	Dose rate
Auto 1 pulsed	Pulsed Fluoro	Paed	Continuous	-	174
			Pulsed 1	12.5	87
			Pulsed 2	8	43
			Pulsed 3	3	17
Auto 2 pulsed	Pulsed Fluoro	Antiisowatt	Continuous	-	174 (USA: 226)
			Pulsed 1	12.5	117
			Pulsed 2	8	78
			Pulsed 3	3	45
Auto 3 pulsed	Pulsed Fluoro	C03 Iodine	Continuous	-	400
			Pulsed 1	12.5	280
			Pulsed 2	8	200
			Pulsed 3	3	140

Tab. 8

NOTE

The Fluoro program "Auto 4" is not used at UROSKOP Access.

- After checking the parameter according Tab. 7/Tab. 8, confirm the "Configure: Site Structure: Edit Fluoro Programs" window with "OK".
The "Configure: Site Structure: Site Adjustments" window appears.
- Check if the parameter "Format dependend correction" is set to "0".
 - Change it if necessary.
- Select "Adjustment/TV Param" in the XCS SSW.
- Check the following settings (Tab. 9; Tab. 10).

Mode Fluoro:	Videomode (Gamma)
Analog DL ¹	2
Continuous	2
Pulsed	2

Tab. 9

1. if this mode is displayed in XCS SSW window

Exposure	Videomode
Direct Tech-nique ¹	5
DR	5

Tab. 10

1. if this mode is displayed in XCS SSW window
- If changes were made in these settings (Tab. 9; Tab. 10), select the "Put to unit" button and select the "Close" button.

Image Chain Default Values

- Enter the FLC service mode.
- Select "Image Chain Default Values" under the "Configuration" menu.
- Check the following parameters (Tab. 11).

AGC nominal	14 %
Measuring area	8
V-reverse on	selected
H-reverse on	not selected
Harmonisation Autowindow	not selected

Tab. 11

- Close the "Image Chain Default Values" task card with the "OK" button.

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X-ray Tube, Collimator

NOTE

Information is filed in the "test certificate 1" from factory.



X-ray Tube, Prefiltration

NOTE

Information is filed in the "test certificate 1" from factory.

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TV Centering

- Select zoom format 0 (full format).
- Select FLC service mode and the "Diagnostic" menu.
- Select the task card "Image Diagnostic".
 - Make sure that the checkbox "Check II-centering" is marked.
- Select "Start Test".
- Release Fluoro and flip image horizontal and vertical under radiation.
- Evaluate the image on the monitor.



There are two circles displayed on the monitor: the blanking circle from the TV camera and the border of the image intensifier output screen (Fig. 1).

Desired result:

By a sure eye the two circles are concentric. A deviation of 2 mm between image flip horizontal and vertical is permitted.

NOTE

Deviating from Fig. 1 you will see the diagonal iris diaphragms between inner and outer circle.

	Zoom 0	yes	no
Image centering OK	Factory:		
	f:		
	r:		

Tab. 1

- Stop the test with the buttons "Stop Test" and "Cancel".
- Note the results (Tab. 1)

NOTE

If the two circles are not concentric, adjust the centering of the TV camera.

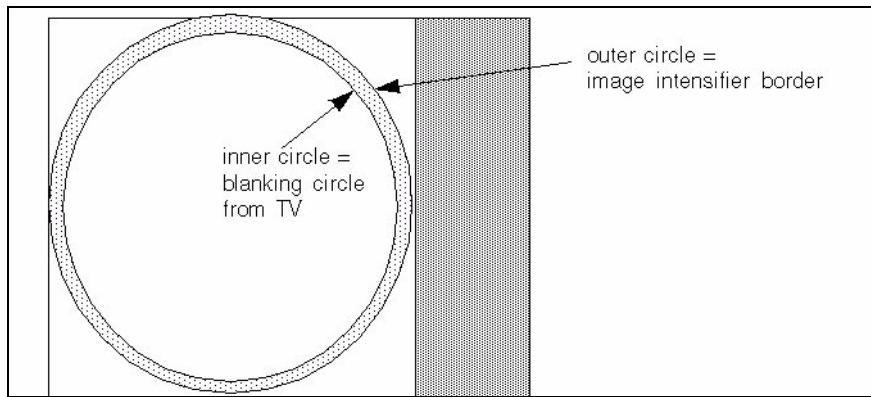


Fig. 1



Measuring Area PDA

- Remove the covers of I. I. and light distributor.
- Switch S1 switch on D100 board of light distributor at I. I. to position "2".
The PDA sensor is illuminated.
- Reattach the cover of the light distributor.
- Select FLC service mode.
- Select the "Settings" sub task card in the patient list and press the "IQ" button.
- Switch SS switch "off" and release Fluoro for approx. 10 sec.
The PDA sensor is displayed.
- Start IEM.
- Move the mousepointer to the tip of the visible bars of the solid light sensor (Fig. 2).
- Read out and record the X- and Y-coordinates of the ROI displayed in the operating area.
 - Note the results (Tab. 2).
- Switch S1 switch on board D100 of the light distributor back to position "1".

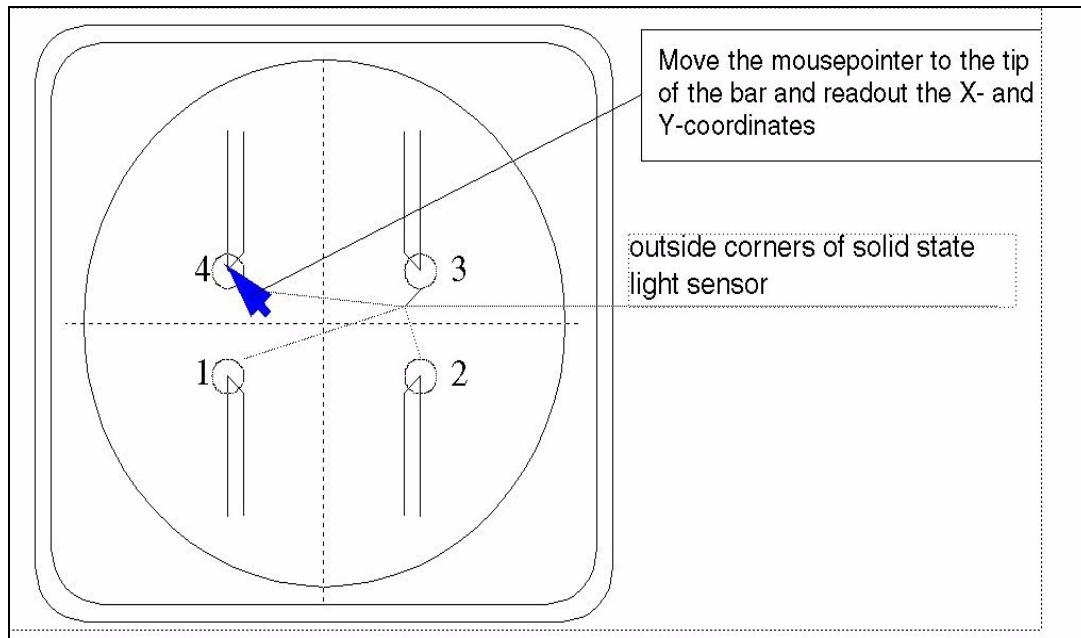


Fig. 2

Bar 4		Bar 3	
X-position	Y-position	X-position	Y-position
311 - 361	413 - 463	665 - 715	413 - 463
Factory:	Factory:	Factory:	Factory:
f:	f:	f:	f:
r:	r:	r:	r:
Bar 1		Bar 2	
311 - 361	560 - 610	665 - 715	560 - 610
Factory:	Factory:	Factory:	Factory:
f:	f:	f:	f:
r:	r:	r:	r:

Tab. 2

Remarks:.....



Visibility of Iris Diaphragm

- Move the unit to 0° position.
- Select zoom format 0 (full format).
- Open collimator fully.
- Switch SS "on" and release Fluoro.



Desired result:

By a sure eye check if all collimator blades are visible and symmetrically adjusted in the image (Fig. 3). Note the results (Tab. 3).

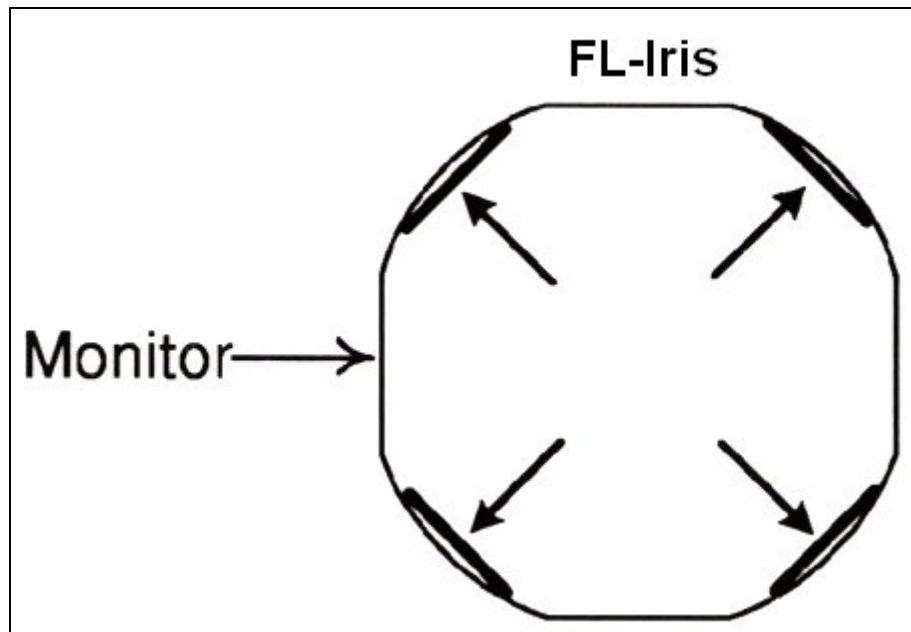


Fig. 3

- Repeat the measurement for all zoom formats.
- Terminate Fluoro.

NOTE

**The collimator blades have to be slightly visible and symmetrical.
Symmetrical tolerance: 5 mm on the monitor. Do not mind the monitor size.**

All zoom formats		yes	no
Both pairs visible	Factory:		
	f:		
	r:		
Symmetrical	Factory:		
	f:		
	r:		

Tab. 3

Remarks:.....

NOTE

The following three adjustment procedures ("Adjusted mA during Dose Setup", "PDA Check" and "Iris Basic Setup") have always to be performed together.



Adjusted mA during Dose Setup

NOTE

If a dose setup is done, enter the value of the adjusted mA in Tab. 5 which is acquired during following procedure.

Dose Rate

- Move the unit to 0° position.
- Place a 1.2 mm precision Cu filter in the collimator.
 - Select 0 mm Cu at collimator.
- The patient pad has to be removed if placed on tabletop.
- Place the dose chamber on the table so that the chamber is positioned in the center beam.
- Select a filter value of 23.5 mm/27.5 mm Al (depending on DIADOS version).
- Select zoom to full format (zoom 0).
- Select the middle dominant.
- Start the XCS SSW.
- Select the menus "Components/Polydoros SX/Adjustment/Doserate".
- Release Fluoro through the service PC.
- Change the tube current during fluoro to adjust the dose rate to following values.



	Dose rate on tabletop [nGy/s]	Attenuation factor	Entrance dose at I. I. [nGy/s]
without cassette option	1740 (+/-5%)	2.0	870 (870 nGy/s x 2)
with cassette option	1905 (+/-5%)	2.19	870 (870 nGy x 2.19)

Tab. 4

- Terminate Fluoro.
- Confirm the window with "OK".

The "PDA Preadjust" menu appears.

NOTE

The PDA adjustment (described in following subchapter) is compulsory after this dose setup has been performed.

mA value
Factory:
f:
r:

Tab. 5

**PDA Check**

- Remove the dose chamber.
- Switch S1 and S2 at D100 board in generator to position "1".
- Select zoom to full format (zoom 0) and open the collimator fully.
- Release Fluoro through the service PC.

The displayed value "expected actual value [1/4]" has to be "0" +/-1.

**NOTE**

If the "expected actual value [1/4]" is not correct, perform the PDA adjustment.

- Confirm with "OK".

The "PDA sensitivity Autocalibration" menu appears.

- Start the autocalibration by selecting the "Start" button.

The autocalibration is automatically performed for all I. I. formats and all dominant selections.

- Compare the results in the table in the "PDA Adjusted Values [EP/16]" as follows.
 - The value "Max. II-Format" for two dominants in parallel must correspond approximately to the value of the circular dominant (approx. 0).
 - The value for the individual dominants must be approx. 50.
 - The largest value must result for all three dominants (left, middle, right) in parallel (about 65).

NOTE

If the basic adjustment of the PDA could not be performed correctly, the message "AbsDiff value is bigger than 24" may appear and indicates an error.

After acknowledging with "OK" a list of the values set is displayed.

On the basis of the values in the first column (I. I. full format) it is possible to determine which dominants were set incorrectly.

- Exit the "PDA Adjusted Values [EP/16]" window with "OK".
 - The "TV Iris: Min/Max. Adjust" window automatically appears.
- Perform the further steps as described in the XCS SSW window.
 - After finishing these adjustments, the "TV Iris: Brightness Adjust" window appears.
This adjustment has to be done as described below.

NOTE

The iris basic setup (described in following subchapter) is compulsory after the PDA check has been performed.



Iris Basic Setup

- ### First Iris Adjust Step
- Confirm the "Polydoros Service" window with "OK".
 - Place a 2.1 mm precision Cu filter in the collimator.
 - Release Fluoro by selecting "ON" in the XCS SSW window.
 - Adjust the "Iris value" in the XCS SSW as far as B signal value of 110 +/-10% is adjusted.
 - Select the "Successful" button after successful adjustment of the iris value but still under radiation.
 - Note the results in Tab. 6.



Second Iris Adjust Step

- Place a 1.2 mm precision Cu filter in the collimator.
- Select "2.5 mA" als start value in the XCS SSW window.
- Release Fluoro by selecting "ON" in the XCS SSW window.
- Adjust the mA value in the XCS SSW as far as B signal value of 110 +/-10% is adjusted.
- Select the "Successful" button after successful adjustment of the iris value but still under radiation.
- Note the results in Tab. 6.



Third Iris Adjust Step

- Select an iris value of approx. "40".
- Release Fluoro by selecting "ON" in the XCS SSW window.
- Adjust the iris value in the XCS SSW as far as B signal value of 110 +/-10% is adjusted.
- Select the "Successful" button after successful adjustment of the iris value but still under radiation.
- Note the results in Tab. 6.
- Exit the adjustment procedure with "OK".
- Switch system off and on again.



	Iris value	B signal
Iris adjust step 1	n. a.	110 +/- 10%
	Factory:	Factory:
	f:	f:
	r:	r:
Iris adjust step 2	n. a.	n. a.
	Factory:	Factory:
	f:	f:
	r:	r:
Iris adjust step 3	n. a.	n. a.
	Factory:	Factory:
	f:	f:
	r:	r:

Tab. 6



Dose Rate

NOTE

The dose measuring chamber has to be documented in the DHHS protocol.

- Take over the dose rate D and dose D_{Exp} from Tab. 7 to Tab. 8/Tab. 9 (default values) depending on I. I. size and cassette option.
- Place a 2.1 mm precision Cu filter in the collimator.
If there is a Diamentor installed, leave the chamber in the beam path.
- Remove the patient pad if placed on the tabletop.

NOTE

For DIADOS select a filter of 23.5 mm/27.5 mm Al (depending on the DIADOS version).

- Place the dose chamber on the table so that the chamber is on the right or left side of the monitor (Fig. 4).
The long side of the chamber has to be parallel to the monitor border. The position of the dose chamber applies to zoom format 3.

- Check the position of the dose chamber under radiation.

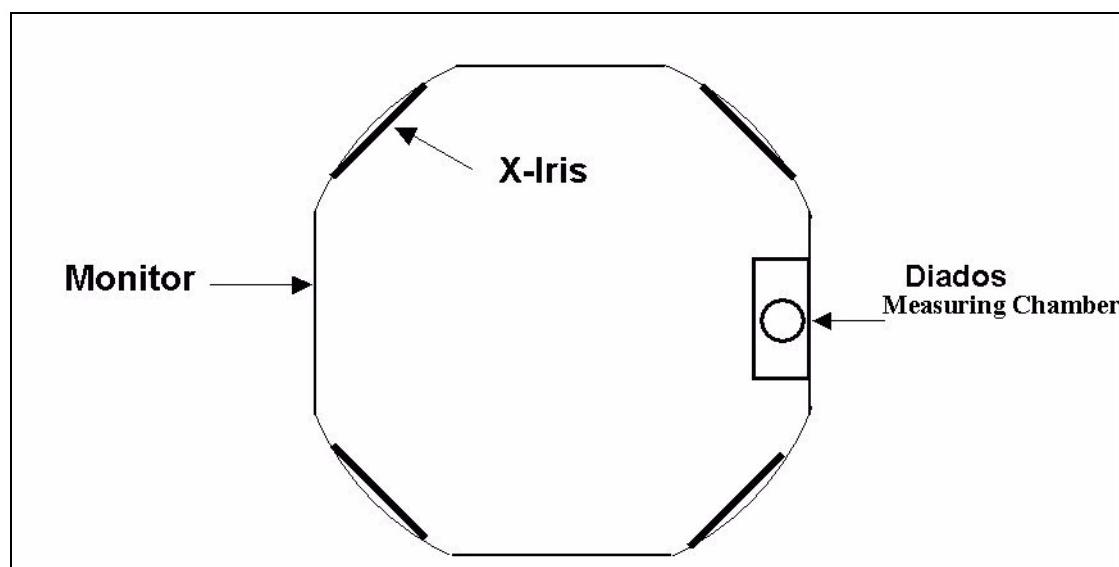


Fig. 4

- Select FLC service mode.
- Select Service Organ Program OGP 1.

NOTE

Select zoom 1.



- Release Fluoro for approx. 5 sec. and measure the dose rate and mA value which are displayed on the monitor during radiation and record the value in the appropriate table.

This is the reference value for the other mA values (displayed mA value = I_{refA1}).



- Set zoom to full format (Zoom 0).
- Release Fluoro for approx. 5 sec. and record the mA value which is displayed on the monitor during radiation in the table.
- Repeat this procedure for all other zoom formats.
- Set zoom to "Zoom 1" again.
- Select the Service Organ Program OGP 2 (DPF 12.5) if the option "Carevision" is available.



- Release Fluoro for approx. 5 sec., measure and record the dose rate and mA value which are displayed on the monitor during radiation in the table.
- Repeat this step for all the other OGP's listed in Tab. 8.
- Select the Service Organ Program OGP 2 (1 f/s).
- Release DR, measure and record the dose per pulse in Tab. 9.
- Calculate the necessary mA values/dose rates marked with "Calculation" in Tab. 8 by using the calculation factors from Tab. 7.



NOTE

The dose values in this table are fixed in the Service Organ Programs. This values do not necessarily match with the configured dose values in the customer organ programs.

NOTE

For the values in the dose rate table (Tab. 8) a tolerance of +/- 10% applies, where no tolerance is expressly written.

		33 cm I. I. (with cassette)	40 cm I. I. (with cassette)	40 cm I. I. (without cassette)
Zoom 0	Nominal size [mm]	305	365	365
	Calc. Factor C0	0.48	0.72	0.72
Zoom 1	Nominal size [mm]	220	300	300
	Fluoro cont. Dose rate D [nGy/s]	515	263	240
	DR Dose D_{Exp} [μ Gy/p]	2.74	1.34	1.22
	Calc. Factor C1	1.00	1.00	1.00
Zoom 2	Nominal size [mm]	170	220	220
	Calc. Factor C2	1.72	2.09	2.09
Zoom 3	Nominal size [mm]	130	170	170
	Calc. Factor C3	2.47	3.57	3.57

Tab. 7

	Zoom 0	Zoom 1		Zoom 2	Zoom 3	
1	mA	Dose rate [nGy/s]	mA	mA	mA	kV
Fluoro cont. (OGP 1)	$I_{refA1} * C0$ (+/-25%)	D_m $D (+/-10\%) =$ $D_m = I_{refA1}$	displayed mA = I_{refA1}	$I_{refA1} * C2$	$I_{refA1} * C3^2$	n. a.
	Calculation:	Default value (Tab. 7):	n. a.	Calculation:	Calculation:	n. a.
	Factory:	Factory:	Factory:	Factory:	Factory:	Factory:
	f:	f:	f:	f:	f:	f:
	r:	r:	r:	r:	r:	r:
DPF (12.5 f/s; OGP 2)	n. a.	$D_m/2.4$ (+/-15%)	n. a.	n. a.	n. a.	
		Calculation:	n. a.			
		Factory:	Factory:			
		f:	f:			
		r:	r:			
DPF (8 f/s; OGP 3)	n. a.	$D_m/3.75$ (+/-15%)	n. a.	n. a.	n. a.	
		Calculation:	n. a.			
		Factory:	Factory:			
		f:	f:			
		r:	r:			

Tab. 8

	Zoom 0	Zoom 1		Zoom 2	Zoom 3	
1	mA	Dose rate [nGy/s]	mA	mA	mA	kV
DPF (3 f/s; OGP 4)	n. a.	D _m /10 (+/-25%)	n. a.	n. a.	n. a.	
		Calculation:	n. a.			
		Factory:	Factory:			
		f:	f:			
		r:	r:			

Tab. 8

1. Actual value measured on table top [nGy/s]; [mA]
2. The factor is only valid on 70 kV, otherwise n. a.!

	Zoom 1
	Dose D_{Exp} [μGy/p]
DR (1 f/s; Dose 100; OGP 2)	D _{Exp} (+/- 15%)
	Default value (Tab. 7):
	Factory:
	f:
	r:

Tab. 9



Indirect Dose Control

- Remove the dose chamber.
- Place a 2.1 mm precision Cu filter in the collimator.
If there is a Diamenter installed, leave the chamber in the beam path.
- Set zoom to "Zoom 1".

NOTE

These checks are only performed with Zoom 1.

- Open collimator fully.
- Select service mode and Service Organ Program OGP 1.
- Release Fluoro or DR according Tab. 10.
- Measure and record the displayed kV, mA, ms or mAs values for all modes.



- Remove the 2.1 mm Cu filter.

NOTE

The tolerances are +/- 15% of the mA respectively mAs value from the basic test.

If the value is out of tolerance, check the dose rate according to the appropriate paragraph.

		kV	mA	ms	mAs
Zoom 1	Fluoro cont. (OGP 1)	70	n. a.	n. a.	n. a.
		Factory:	Factory:		
		f:	f:		
		r:	r:		
	DPF (12.5 f/s; OGP 2)	70	n. a.	n. a.	n. a.
		Factory:	Factory:		
		f:	f:		
		r:	r:		
	DR (1 f/s; OGP 2; Dose 100)	70	n. a.	n. a.	n. a.
		Factory:		Factory:	Factory:
		f:		f:	f:
		r:		r:	r:

Tab. 10

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General

NOTE

The SMFit light field luminance meter is used for measuring the brightness.



Display Test Image at Monitor

NOTE

For the following adjustments/checks of the monitors test image S8_8 from the "pattern\img" folder is used (Fig. 1).

NOTE

The "pattern" folder is located at "D:\Studies\pattern\img".

- Start FLC service mode.
- Select the "Check test images" button in the "Settings" sub task card (Fig. 1).
The "Postprocessing" task card is activated automatically.

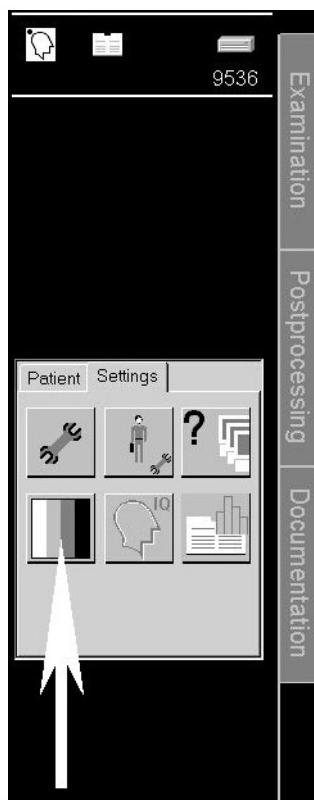


Fig. 1

- Probably you have to select the "Display overview" button.
 - Select the test image "S8_8" (Fig. 2).

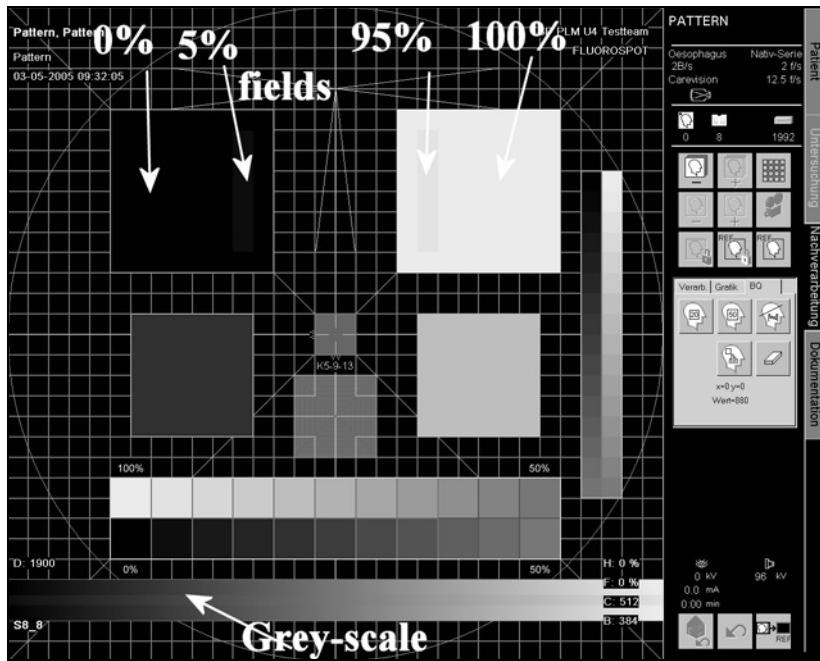


Fig. 2



Monitor 1 - Live Monitor at TFT Support Arm

Luminance

NOTE

Do not unlock the OSD menu.

- Select the monitor testimage "S8_8".
- Measure and record the brightness in the black (0 %) and white (100 %) area of the image (Tab. 1).

Adjusted luminance [cd/m ²]	DSC 1703-DC-V	
Serial no.	Black (0 %)	White (100 %)
	0,5 +/- 0,2	137 +20/-10
	Factory:	Factory:
	f:	f:
	r:	r:

Tab. 1

Monitor Function

- Select the monitor testimage "S8_8".
- Check if all border lines are visible.
 - Record if the image alignment is ok (Tab. 2).
- Check if all black and white line pairs are visible and recognizable in the center of the monitor.
 - Record if the sharpness is ok (Tab. 2).
- Check if the 5% and 95% fields in the black and white field are visible.
 - Record if the fields are visible (Tab. 2).
- Check if the grey-scale is clearly visible and record it in Tab. 2.
- Press function key F5.
 - The FLC service main menu is displayed on the monitor.

	Zoom 0	yes	no
Image alignment ok	Factory:		
	f:		
	r:		
Sharpness ok	Factory:		
	f:		
	r:		
5% field/ 95% field visible	Factory:		
	f:		
	r:		
Grey-scale clearly visible	Factory:		
	f:		
	r:		

Tab. 2



Monitor 2 - Reference Monitor at TFT Support Arm

Luminance

NOTE

Do not unlock the OSD menu.

- Select the monitor testimage "S8_8".
- Measure and record the brightness in the black (0 %) and white (100 %) area of the image (Tab. 3).

Adjusted luminance [cd/m ²]	DSC 1703-DC-V	
Serial no.	Black (0 %)	White (100 %)
	0,5 +/- 0,2	137 +20/-10
	Factory:	Factory:
	f:	f:
	r:	r:

Tab. 3

Monitor Function

- Select the monitor testimage "S8_8".
- Check if all border lines are visible.
 - Record if the image alignment is ok (Tab. 4).
- Check if all black and white line pairs are visible and recognizable in the center of the monitor.
 - Record if the sharpness is ok (Tab. 4).
- Check if the 5% field and 95% field in the black and white field are visible.
 - Record if the fields are visible (Tab. 4).
- Check if the grey-scale is clearly visible and record it in Tab. 4.
- Press function key F5.
 - The FLC service main menu is displayed on the monitor.

	Zoom 0	yes	no
Image alignment ok	Factory:		
	f:		
	r:		
Sharpness ok	Factory:		
	f:		
	r:		
5% field/95% field visible	Factory:		
	f:		
	r:		
Grey-scale clearly visible	Factory:		
	f:		
	r:		

Tab. 4



Monitor 3 - Live Monitor in Control Room

Luminance

NOTE

Do not unlock the OSD menu.

- Select the monitor testimage "S8_8".
- Measure and record the brightness in the black (0 %) and white (100 %) area of the image (Tab. 5).

Adjusted luminance [cd/m ²]	DSB 1803 DC ¹	Eizo R11
Serial no.		
Black (0 %)	0,5 +/- 0,15	0,5 +/- 0,1
	Factory:	Factory:
	f:	f:
	r:	r:
White (100 %)	260 +/- 30	140 +10/-30
	Factory:	Factory:
	f:	f:
	r:	r:

Tab. 5

1. Ambient light sensor is activated and covered.

Monitor Function

- Select the monitor testimage "S8_8".
- Check if all border lines are visible.
 - Record if the image alignment is ok (Tab. 6).
- Check if all black and white line pairs are visible and recognizable in the center of the monitor.
 - Record if the sharpness is ok (Tab. 6).
- Check if the 5% field and 95% field in the black and white field are visible.
 - Record if the fields are visible (Tab. 6).
- Check if the grey-scale is clearly visible and record it in Tab. 6.
- Press function key F5.
 - The FLC service main menu is displayed on the monitor.

	Zoom 0	yes	no
Image alignment ok	Factory:		
	f:		
	r:		
Sharpness ok	Factory:		
	f:		
	r:		
5% field/95% field visible	Factory:		
	f:		
	r:		
Grey-scale clearly visible	Factory:		
	f:		
	r:		

Tab. 6



Monitor 4 - Reference Monitor in Control Room

Luminance

NOTE

Do not unlock the OSD menu.

- Select the monitor testimage "S8_8".
- Measure and record the brightness in the black (0 %) and white (100 %) area of the image (Tab. 7).

Adjusted luminance [cd/m ²]	DSB 1803 DC ¹	Eizo R11
Serial no.		
Black (0 %)	0,5 +/- 0,15	0,5 +/- 0,1
	Factory:	Factory:
	f:	f:
	r:	r:
White (100 %)	260 +/- 30	140 +10/-30
	Factory:	Factory:
	f:	f:
	r:	r:

Tab. 7

1. Ambient light sensor is activated and covered.

Monitor Function

- Select the monitor testimage "S8_8".
- Check if all border lines are visible.
 - Record if the image alignment is ok (Tab. 8).
- Check if all black and white line pairs are visible and recognizable in the center of the monitor.
 - Record if the sharpness is ok (Tab. 8).
- Check if the 5% field and 95% field in the black and white field are visible.
 - Record if the fields are visible (Tab. 8).
- Check if the grey-scale is clearly visible and record it in Tab. 8.
- Press function key F5.
 - The FLC service main menu is displayed on the monitor.

	Zoom 0	yes	no
Image alignment ok	Factory:		
	f:		
	r:		
Sharpness ok	Factory:		
	f:		
	r:		
5% field/95% field visible	Factory:		
	f:		
	r:		
Grey-scale clearly visible	Factory:		
	f:		
	r:		

Tab. 8

Checking the Iris Adjustment for Fluoro Modes

D

- Place a 2.1 mm precision Cu filter in the collimator.
- Open the collimator fully.
- Set zoom 0 (full format).
- Select service mode and select Service Organ Program OGP 1.
- Switch SS "on" and release Fluoro for approx. 15 sec.



- On the right side of the monitor a numerical value called "DVP" is displayed and refreshed periodically. After regulation has equalized watch the display for approx. 10 s and record the approximate average value (Tab. 1).
- Switch to another zoom according Tab. 1 and repeat the steps above.
- Select next Service Organ Program and repeat the steps above.

D

Checking the Iris Adjustment for Exposure Modes

DR Exposure in Tab. 2

- Place a 2.1 mm precision Cu filter in the collimator.
- Open the collimator fully.
- Set zoom to "Zoom 1".
- Select service mode and select Service Organ Program OGP 1.
- Select "4 f/s" in the "Acquisition Rate 1" list box for OGP 1 and confirm this setting with the "Store" button.
- Switch SS "on, release DR and wait until scene is finished by organ program.
- On the right side of the monitor a numerical value called "DVP" is displayed. Record this "DVP" in the appropriate field (Tab. 2).



NOTE

Set the "Acquisition Rate 1" of OGP 1 back to "6 f/s" and confirm this new setting with the "Store" button.



- Select Service Organ Program OGP 2, release exposure and record the "DVP" again (Tab. 2).

	Zoom 0	Zoom 1	Zoom 2	Zoom 3
Fluoro cont. (OGP 1)	110 +/-10%	110 +/-10%	110 +/-10%	110 +/-10%
	Factory:	Factory:	Factory:	Factory:
	f:	f:	f:	f:
	r:	r:	r:	r:
DPF 12.5 f/s (OGP 2)	n. a.	110 +/-10%	n. a.	n. a.
		Factory:		
		f:		
		r:		
DPF 8 f/s (OGP 3)	n. a.	110 +/-10%	n. a.	n. a.
		Factory:		
		f:		
		r:		
DPF 3 f/s (OGP 4)	n. a.	110 +/-10%	n. a.	n. a.
		Factory:		
		f:		
		r:		

Tab. 1

DR		
	1 f/s (OGP 2)	4 f/s (OGP 1)
Zoom 1	110 +/-10%	110 +/-10%
	Factory:	Factory:
	f:	f:
	r:	r:

Tab. 2



Vignetting

- Set zoom to "Zoom 0" (full format).
- Place a 2.1 mm precision Cu filter in the collimator.
- Select service mode and select Service Organ Program OGP 1.
- Switch SS "on" and release Fluoro for approx. 10 sec.
- Store LIH through selecting the button "Store", start IEM and measure by selecting the button "ROI20".
- Record the grey values on the specified regions (Fig. 1; Tab. 3).
- Look for the minimum GV value and the maximum GV value (Tab. 3), then calculate according following formula.

$$v = \frac{GV_{\min}}{GV_{\max}}$$

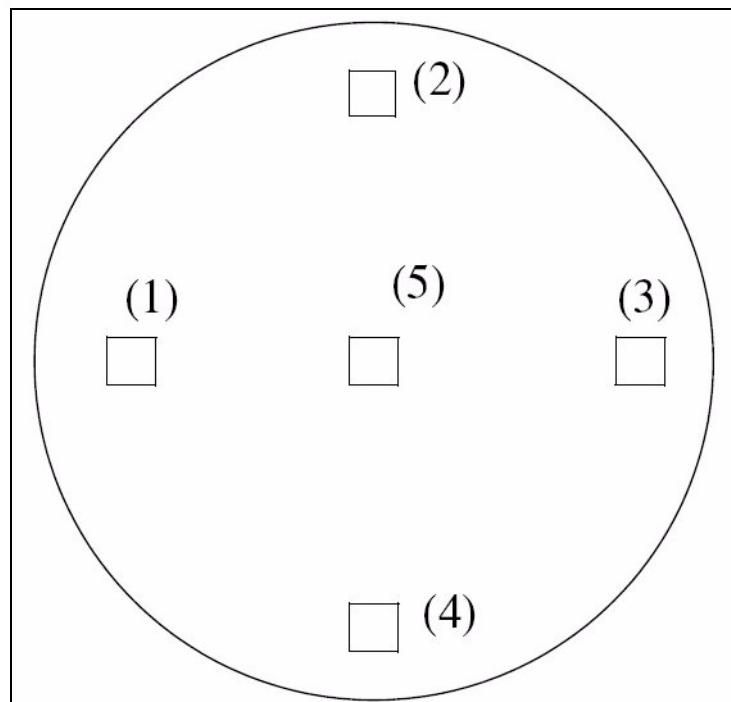


Fig. 1

ROI no.	X position	Y position	ROI20 GV
1	95 - 105	495 - 505	Factory: f:
2	495 - 505	95 - 105	Factory: f:
3	875 - 885	495 - 505	Factory: f:
4	495 - 505	875 - 885	Factory: f:
5	495 - 505	495 - 505	Factory: f:

Tab. 3

$$v = \frac{GV_{\min}}{GV_{\max}} = \frac{\dots\dots\dots}{\dots\dots\dots} = \dots\dots\dots \geq 0,75$$

Remarks:.....

Dynamic Test

**NOTE**

All Cu filters have to be removed.

- Place the dynamic test with heart contour blade on the table top (Fig. 2).
Ensure that only field 1 covers the dominant.

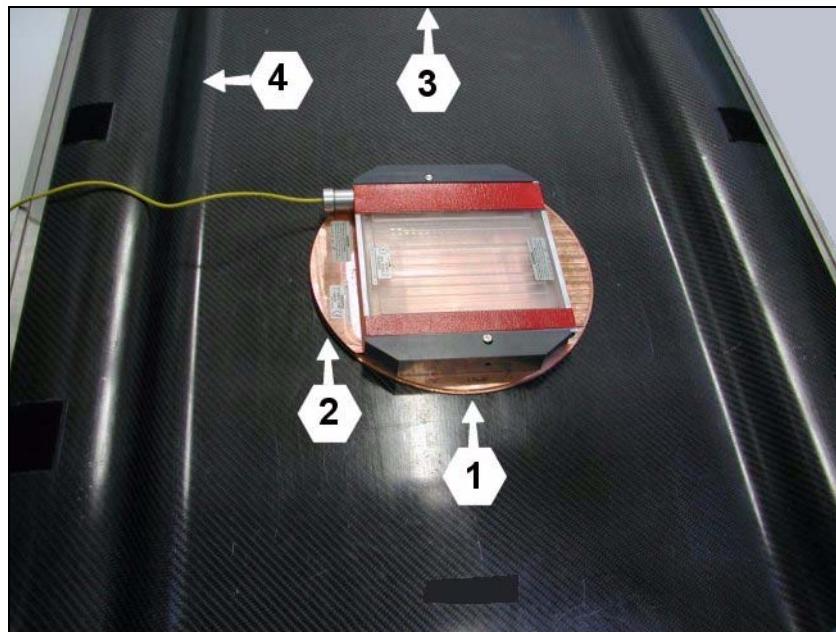


Fig. 2

- 1 - Dynamic test
- 2 - Heart contour diaphragm
- 3 - Patient head end
- 4 - Patient right side

- Open the collimator fully.
- Select zoom 2 for 40 cm I.I./ zoom 1 for 33 cm I. I. depending on the system.
- Select service mode and select Service Organ Program OGP 1.
- Switch SS "on" and release Fluoro for approx. 10 sec.
Look at the Fluoro kV (must be 70 kV).
- Store LIH through selecting the button "Store", start IEM and measure the grey values in field 2L, 1 and 5R by selecting the button "ROI20" (Fig. 3).



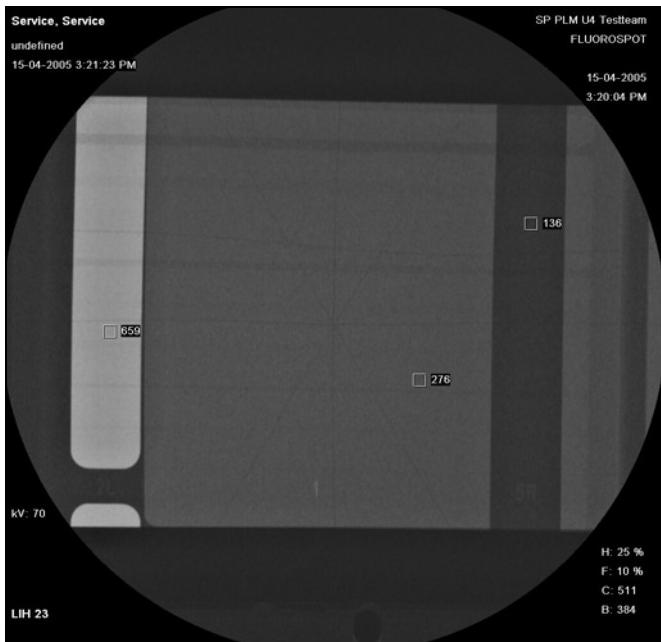


Fig. 3

- Record the measured grey values (Tab. 4).
- Select the next Service Organ Program and repeat the steps above.

	Grey values				
Mode	2L	1	5R	Displayed kV	
Fluoro cont. (OGP 1)	650 -10%/+20%	290 +/-10%	< 155	70	
	Factory:	Factory:	Factory:	Factory:	
	f:	f:	f:	f:	
	r:	r:	r:	r:	
DPF (12.5 f/s, OGP 2)	650 -10%/+20%	290 +/-10%	< 155	70	
	Factory:	Factory:	Factory:	Factory:	
	f:	f:	f:	f:	
	r:	r:	r:	r:	
DPF (8 f/s, OGP 3)	650 -10%/+20%	290 +/-10%	< 155	70	
	Factory:	Factory:	Factory:	Factory:	
	f:	f:	f:	f:	
	r:	r:	r:	r:	
DPF (3 f/s, OGP 4)	650 -10%/+20%	290 +/-10%	< 155	70	
	Factory:	Factory:	Factory:	Factory:	
	f:	f:	f:	f:	
	r:	r:	r:	r:	
DR (3 f/s, OGP 2)	680 -10%/+20%	330 +/-10%	< 190	70	
	Factory:	Factory:	Factory:	Factory:	
	f:	f:	f:	f:	
	r:	r:	r:	r:	

Tab. 4



Capillary Test

NOTE

The capillaries are divided into 3 groups having 3 mm, 2 mm and 1 mm width with varying contrast.

The primary contrast of the plexiglas lines is specified for 70 kV. The actual contrast - especially for the 1 mm line - is significantly reduced by the MTF of the imaging chain.

- Select service mode and select Service Organ Program OGP 1.
- Insert the heart contour blade and capillary test in the TV Dynamics Test so that the 1 mm diameter capillaries are located on the same side as the number code of the TV dynamics test steps, and the steps from 5R through 2L are covered by the plexiglass lines.

The TV Dynamics Test has to be centered to the central beam. Ensure that only field 1 covers the dominant.

- Open the collimator fully.
- Select zoom 2 for 40 cm I.I./ zoom 1 for 33 cm I. I.
- Release Fluoro for approx. 10 sec.
- Store through selecting the button "Store" and set window level so that most of the capillaries are visible in field 2L, 1 and 5R.
- Record those fields with a cross, in which the plexiglass lines are visible (Fig. 4, for factory settings; Fig. 6, for startup or diagnostic).

**NOTE**

The plexi capillaries marked must be visible (Fig. 5/Fig. 7).

Factory Settings

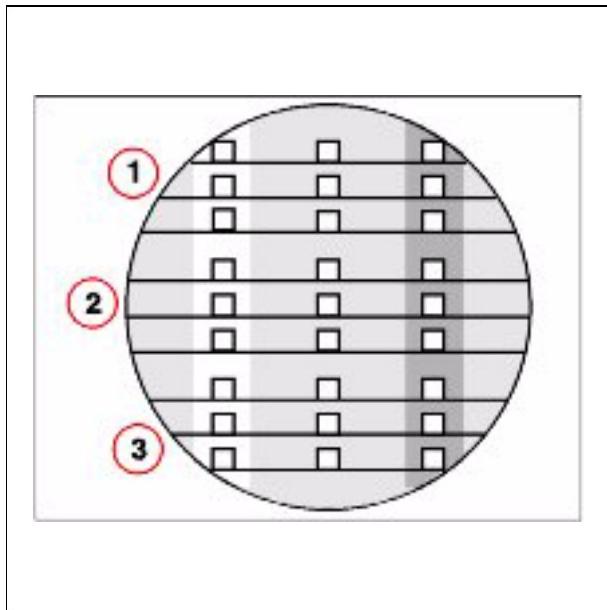


Fig. 4 Actual value

- 1 - Group 3 mm wide
- 2 - Group 2 mm wide
- 3 - Group 1 mm wide

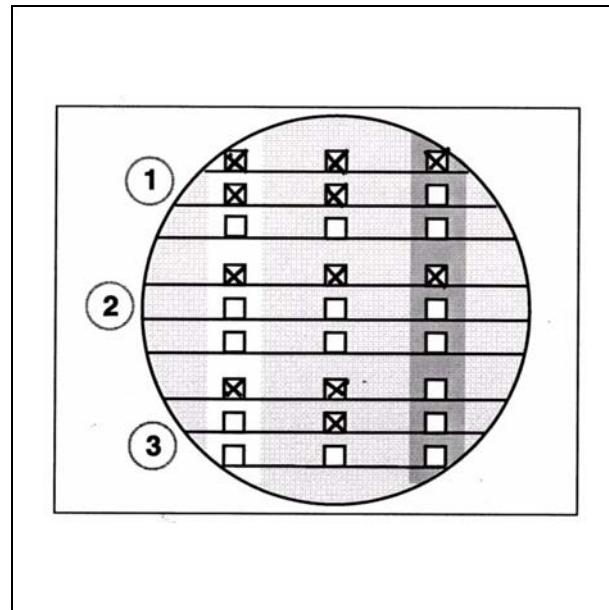


Fig. 5 Setpoint

NOTE

The 3 columns of checkboxes in Fig. 4/Fig. 5/Fig. 6/Fig. 7 correspond to the image fields 2L, 1 and 5R.

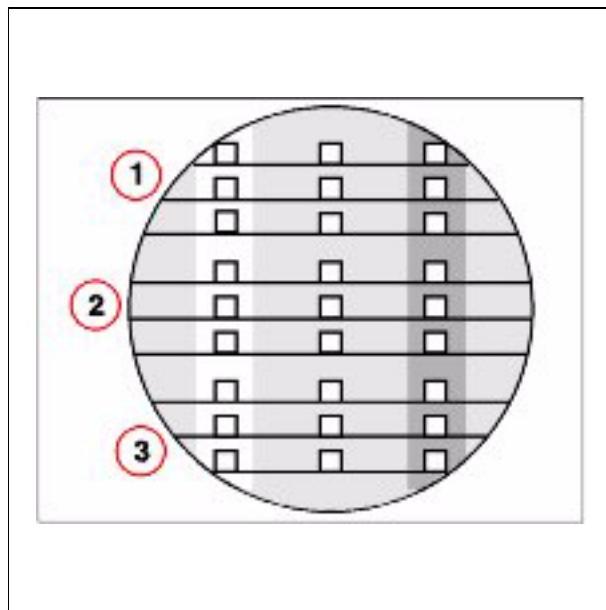
Start-up/Diagnostic

Fig. 6 Actual value

- 1 - Group 3 mm wide
- 2 - Group 2 mm wide
- 3 - Group 1 mm wide

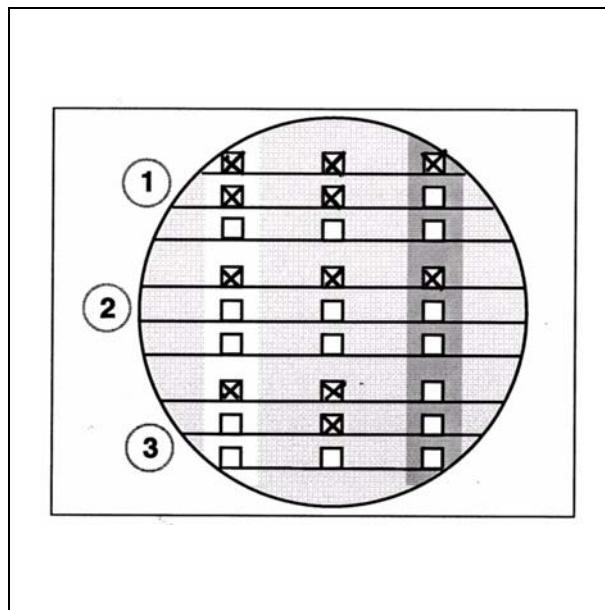


Fig. 7 Setpoint

Remarks:.....

**Resolution Test****Test for DL****NOTE**

Use resolution test type 41: 0.6 ... 3.4 LP/mm.

- Attach the resolution test to the center of the image intensifier approx. 45 degree out of horizontal position.
- Place 1,2 mm Cu in the collimator.
- Place a 17 µm Cu test strip close beside the resolution test.
- Select I. I. zoom format and Service OGP according Tab. 5.
- Collimate to the resolution test.
- Release Fluoro.
- Select the "Store image" button.
- Check and record the center resolution on the live monitor at the TFT support arm for all modes (Tab. 5).



	Fluoro cont. (OGP 1)		DPF 12.5 f/s (OGP 2)	
I. I. zoom	Zoom 0 (full)	Zoom 2	Zoom 0	Zoom 3
Resolution [LP/mm]	Factory:	Factory:	Factory:	Factory:
	f:	f:	f:	f:
	r:	r:	r:	r:
Default values 33 cm I. I.	≥ 1.2	≥ 2.0	≥ 1.2	≥ 2.5
Default values 40 cm I. I.	≥ 1.0	≥ 1.6	≥ 1.0	≥ 2.2

Tab. 5

- Check if the minimal contrast is OK and note it in (Tab. 6).
The 17 µm Cu test strip has to be visible.

Minimal contrast OK?	Factory:yesno
	f:yesno

Tab. 6

Test for DR

NOTE

Use resolution test type 41: 0.6 ... 3.4 LP/mm.

- Attach the resolution test to the center of the image intensifier approx. 45 degree out of horizontal position.
- Switch SS "on" and select an organ program with 50 kV exposure (OGP 4).
- Collimate to the resolution test.
- Release DR.
- Check and record the center resolution on the live monitor at the TFT support arm for all modes (Tab. 7).



To have a better visibility you may zoom and window the image as you like.

I. I. format	Zoom 0 (full)	Zoom 1	Zoom 2	Zoom 3
Resolution [LP/mm]	Factory:	Factory:	Factory:	Factory:
	f:	f:	f:	f:
	r:	r:	r:	r:
Default values 33 cm I. I.	≥ 1.6	≥ 2.2	≥ 2.8	≥ 3.4
Default values 40 cm I. I.	≥ 1.4	≥ 1.8	≥ 2.5	≥ 3.1

Tab. 7

Remarks:.....

NOTE

This chapter is not performed during the assembly in the factory!

Check of the Hardcopy Camera

Startup and adaption of the hardcopy camera (HCC) to our systems is the responsibility of the manufacturer or of the supplier of the HCC. A CSE has to be present so that any connection or image disturbance problem can be resolved quickly.

The check and documentation of the HCC within the framework of our Image Quality Test is limited to the following points described in detail below:

- Documentation of the brightness and contrast setting (look-up tables) of the HCC at the time of customer turnover.
- Check and documentation of the contrast curve and of the geometry on the test films by evaluating the hardcopy test image.
- Check and documentation of disturbance-free image transfer from the DFR system to the HCC and of problem-free camera function.

Adjustment of the Hardcopy Camera

The adjustment device of the hardcopy camera for brightness and contrast curve can be very different, depending on the manufacturer.

If there are complaints regarding HCC image quality, the adjustment of brightness and contrast curve (LUT) must be documented, to be able to compare test films made under the same conditions with the test film made during startup.

The necessary data regarding brightness and contrast adjustment are different and specific to the camera.

Checking the Contrast Curve



Fig. 1

- Select the HCC test image "S3_3" in the "pattern" folder (Fig. 1).
The HCC test image is an image with 21 different grey steps (5% steps).
- Send the image to the HCC.
- Evaluate the 21 grey steps with the densitometer and mark the results in Fig. 2 during startup.
- If a diagnostic test has to be done during service compare the newly measured HCC printout with the startup values marked in Fig. 2.

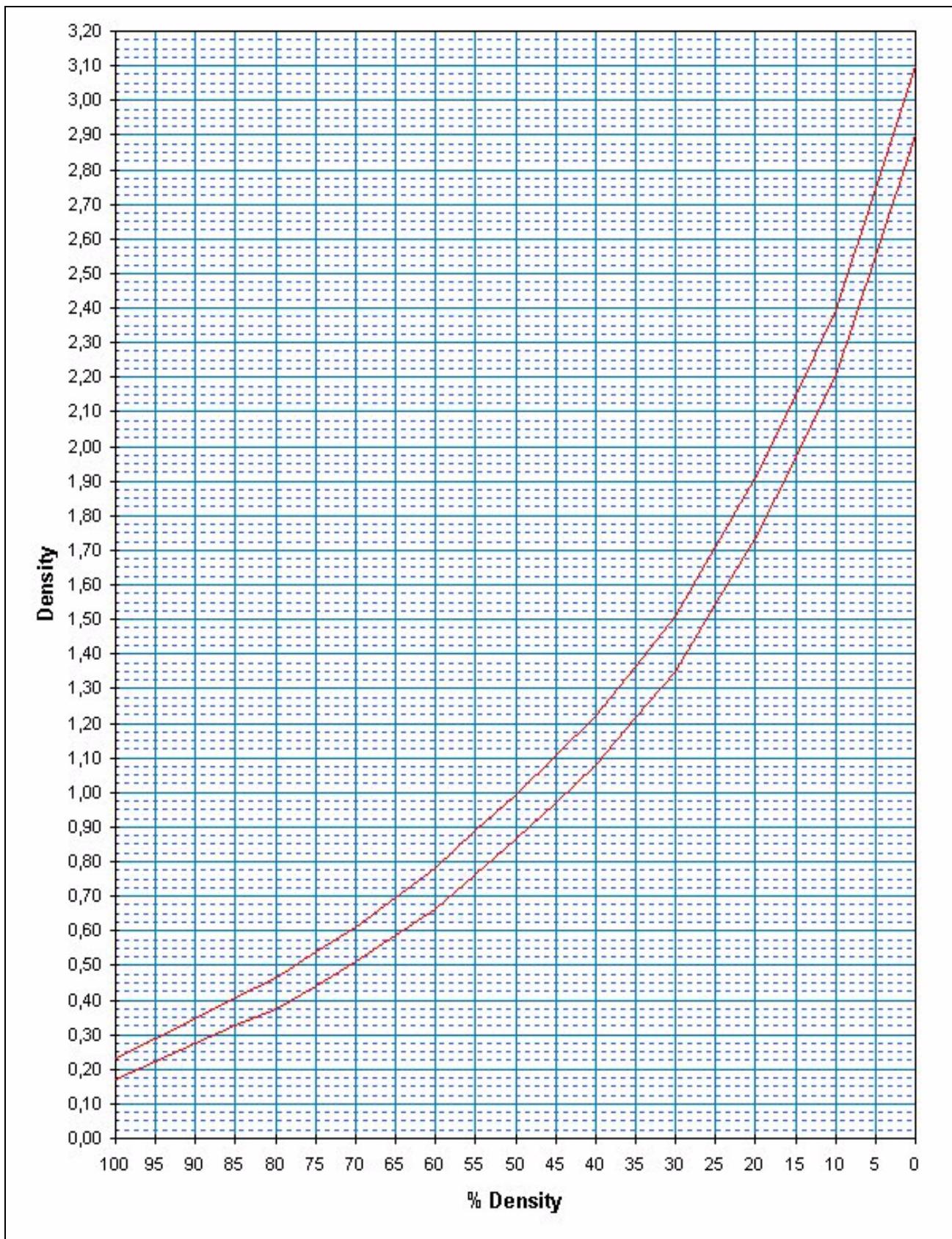


Fig. 2 Nominal values density

Remarks:.....
.....
.....

Printing and Evaluating the Test Image

- Select the "S8_8" in the "pattern" folder (Fig. 3).

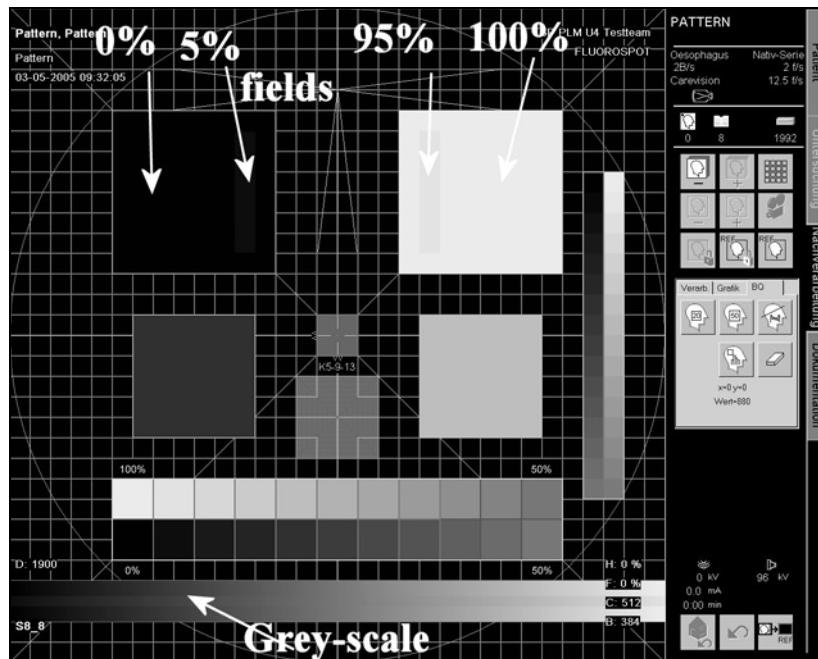


Fig. 3

- Send the image to the HCC camera.
- Evaluate the test image.
- Document whether the 5% and 95% fields (Fig. 3) are visible (Tab. 1).
- The grey-scale (Fig. 3) has to be displayed without disturbances (Tab. 1).
- Evaluate and document whether the image geometry and image focus are as specified (Tab. 1).
 - Geometry: The displayed images must be rectangular (same length sides and right angled). All longer edges must be even.
 - Focus: With the laser cameras, at least all sharply contrasted resolution groups must be recognizable.

With screen cameras, this is not always possible.

NOTE

The film size and subdivisions must be selected so that the focus (resolution) of the test exposures is not limited by the resolution capacity of the hardcopy camera (number of lines).

NOTE

The test film should be archived as part of the IQ documentation along with the IQAP document.

Image Disturbances and Image Transfer Disturbances

NOTE

With digital image transfer from the DFR system to the hardcopy camera, as a rule an error message is sent to the DFR system or to the HCC when there are transfer disturbances; i. e. image disturbances which result from the transfer can scarcely go unnoticed.

- Check the test film for image disturbances and document it (Tab. 1).

Among others, following image disturbances are possible:

- Lines;
- Fraying of sharp edges (jitter);
- Uneven density distribution;
- Disturbance patterns;
- Pixel errors.

If disturbances are detected, a distinction should be made whether they are slight, acceptable disturbances (e. g. with connected analogue screen image cameras) or whether the disturbances are intolerable. With intolerable disturbances, the system may not be turned over to the customer.

The type of disturbance must be documented on the text lines provided for this purpose.

Grey-scale OK?	f:yesno
	r:yesno
5% field visible?	f:yesno
	r:yesno
95% field visible?	f:yesno
	r:yesno
Geometry OK?	f:yesno
	r:yesno
Focus OK?	f:yesno
	r:yesno
Disturbances?	f:yesno
	r:yesno
Pixel errors?	f:yesno
	r:yesno

Tab. 1

Remarks:

DR Service Organ Programs

In the following tables the default parameters for the Service Organ Programs are defined.

If you change any parameter (for IQAP reasons this is not necessary) do not forget to restore the original value. The organ programs are divided into two parts:

- the acquisition program and
- the fluoro program.

If you change any parameter on one part you must press the button "Store" on the displayed organ program page to store the parameter (i. e. if you change the dose level for acquisition press the button "Store" on the acquisition organ program page).

NOTE

All Service OGPs use the "C03 Iodine" as characteristic curve under Fluoro.

NOTE

If there is an option not installed, it is not possible to select the appropriate fluoro mode, i. e. if no Carevision is present it is not possible to select the Carevision Fluoro Modes (15 f/s, 7.5 f/s, 3 f/s). In this case fluoro should be selected.

	DR Service Organ Programs			
	OGP 1	OGP 2	OGP 3	OGP 4
Prog. name	Org32/8	Org32/9	Org32/10	Org32/11
Fluoro mode	Continuous	Carevision (12.5 f/s)	Carevision (8 f/s)	Carevision (3 f/s)
SDM dominant	mid	mid	mid	mid
Dose level	100	100	100	100
Exposure data from Fluoro	n. a.	n. a.	n. a.	n. a.
kV / Auto	70 / no	70 / no	70 / no	50 / no
Characteristic curve	n. a.	n. a.	n. a.	n. a.
kV dose reduction	125	125	125	125
Focus	large	large	large	small
Regulation stop	no	no	no	no
Pulse width	70	400	400	400

Tab. 1

	DR Service Organ Programs			
	OGP 1	OGP 2	OGP 3	OGP 4
Blankening Correction	0	0	0	0
Grid	yes	yes	yes	yes
Acquisition Filter Auto	no	no	no	no
Filter type	0.0 mm Cu	0.0 mm Cu	0.0 mm Cu	0.0 mm Cu
Acquisition mode	Serie NAT	Serie NAT	Serie NAT	Serie NAT
Mark image	no	no	no	no
Auto shutter	no	no	no	no
Bone level	Black	Black	Black	Black
Scene Length	3	10	10	10
Acquisition Rate 1	6	1	1	1
Acquisition Rate 2	1	1	1	1
Acquisition Rate 3	1	1	1	1
Contrast NAT	511	511	511	511
Brightness NAT	384	384	384	384
Edge filter	15	15	15	15
Kernel size	5	5	5	5
Harmonisation	0	0	0	0
Harmonisation kernel	127	127	127	127
Fluoro settings				
Fluoro contrast	511	511	511	511
Fluoro brightness	384	384	384	384
Edge filter	10	10	10	10
Kernel size	5	5	5	5
Noise reduction	25	25	25	25

Tab. 1

	DR Service Organ Programs			
	OGP 1	OGP 2	OGP 3	OGP 4
Fluoro filter	no	no	no	no
Filter type	0.0 mm Cu	0.2 mm Cu	0.2 mm Cu	0.2 mm Cu

Tab. 1

Calculation table [R] to [Gy]

R	Gy	R	Gy	R	Gy	R	Gy	R	Gy
1	0.0087	21	0.1827	41	0.3567	61	0.5307	81	0.7047
2	0.0174	22	0.1914	42	0.3654	62	0.5394	82	0.7134
3	0.0261	23	0.2001	43	0.3741	63	0.5481	83	0.7221
4	0.0348	24	0.2088	44	0.3828	64	0.5568	84	0.7308
5	0.0435	25	0.2175	45	0.3915	65	0.5655	85	0.7395
6	0.0522	26	0.2262	46	0.4002	66	0.5742	86	0.7482
7	0.0609	27	0.2349	47	0.4089	67	0.5829	87	0.7569
8	0.0696	28	0.2436	48	0.4176	68	0.5916	88	0.7656
9	0.0783	29	0.2523	49	0.4263	69	0.6003	89	0.7743
10	0.0870	30	0.2610	50	0.4350	70	0.6090	90	0.7830
11	0.0957	31	0.2697	51	0.4437	71	0.6177	91	0.7917
12	0.1044	32	0.2784	52	0.4524	72	0.6264	92	0.8004
13	0.1131	33	0.2871	53	0.4611	73	0.6351	93	0.8091
14	0.1218	34	0.2958	54	0.4698	74	0.6438	94	0.8178
15	0.1305	35	0.3045	55	0.4785	75	0.6525	95	0.8265
16	0.1392	36	0.3132	56	0.4872	76	0.6612	96	0.8352
17	0.1479	37	0.3219	57	0.4959	77	0.6699	97	0.8439
18	0.1566	38	0.3306	58	0.5046	78	0.6786	98	0.8526
19	0.1653	39	0.3393	59	0.5133	79	0.6873	99	0.8613
20	0.1740	40	0.3480	60	0.5220	80	0.6960	100	0.8700

Calculation Table [R/min] to [mGy/sec]

R/min	mGy/ sec	R/min	mGy/ sec	R/min	mGy/ sec
1	0.1450	6	0.8700	11	1.5950
2	0.2900	7	1.0150	12	1.7400
3	0.4350	8	1.1600	13	1.8850
4	0.5800	9	1.3050	14	2.0300
5	0.7250	10	1.4500	15	2.1750

R/min	mGy/ sec	R/min	mGy/ sec
16	2.3200	21	3.0450
17	2.4650	22	3.1900
18	2.6100	23	3.3350
19	2.7550	24	3.4800
20	2.9000	25	3.6250

n. a.

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